Listing of the Claims:

1. (Amended) A device for writing and processing handwriting comprising:

a body;

a marking element for making strokes comprising a character on a surface, the marking element being coupled to the body;

a detector for detecting each stroke on the surface, and

a processor coupled to the detector, ~~characterizing each detected stroke as one in a set of reference strokes~~, wherein the detector and processor are disposed within the body.

2. (Currently Amended) The device according to claim 1, further comprising an active feedback-mechanism, wherein the ~~photo~~ detector detects the strokes at a periodic rate which is adjusted based on input from ~~an~~ the active feedback-mechanism.

3. (Original) The device of claim 1, wherein the processor identifies the character by combining the recognized strokes of the character and comparing the combined recognized strokes with a reference set of combined recognized strokes.

4. (Original) The device of claim 3, wherein the processor is comprised of a first sub-processor for characterizing each detected stroke as one in a set of reference strokes, and a second sub-processor for identifying the character, the first and second sub-processors functioning asynchronously.

5. (Original) The device of claim 1, wherein the processor characterizes each detected stroke as one in a set of reference strokes by representing each detected stroke as a polynomial representation, comparing the polynomial representation of each detected stroke with polynomial representations as of the reference strokes, and selecting for each detected stroke a reference stroke whose polynomial representation is sufficiently similar to the polynomial representation of the detected stroke.

6. (Original) The device of claim 1, wherein the processor characterizes each detected stroke as one in a set of reference strokes by representing each detected stroke as a vector representation, comparing the vector representation of each detected stroke with vector representations of the reference strokes, and selecting for each detected stroke a reference stroke whose vector representation is sufficiently similar to the vector representation of the detected stroke.

7. (Original) The device of claim 1 further comprising a character output mechanism for outputting a signal representing the character.

8. (Original) The device of claim 1, wherein the detector detects the strokes in the temporal order that the strokes are made.

9. (Currently Amended) A device for writing and processing handwriting comprising:

a marking element for providing on a surface a representation of a character, the character comprising at least one element;

a detector operating according to a detection parameter having a value, the detector detecting an element of the character on the surface;

a processor for comparing ~~the character to a set of reference characters and determining there from whether the character is represented by any one of the reference characters~~ the element to a set of reference elements and determining therefrom whether the element represents a portion of the character; and

an active feedback mechanism for modifying the value of the detection parameter if the detected element ~~character~~ is represented by none of the reference ~~characters~~ elements.

10. (Original) The device of claim 9, wherein the detection parameter is a sampling rate of the detector.

11. (Original) The device of claim 9 further comprising a character output mechanism for outputting a signal representing the character.

12. (Currently Amended) The device according to claim 1, wherein the detector comprises:

a photo emitter mounted ~~on~~ adjacent to a first side of the device, wherein said photo emitter emits light towards the marking element to illuminate the strokes; and

a photo detector mounted on a second side of the device, wherein said photo detector (a) has a field of view that includes the marking element, (b) detects the strokes using the light reflected off the surface, (c) converts the detected strokes into electronic signals, and (d) sends the electronic signals to the processor.

13. (Original) The device according to claim 12, wherein the first side is opposite the second side.

14. (Original) The device according to claim 12, wherein the photo emitter and the photo detector are mounted adjacent to the marking element.

15. (Original) The device according to claim 12, wherein the photo detector detects the strokes at a periodic rate which is adjusted based on input from an active feedback mechanism

16. (Original) The device according to claim 12, wherein the light and the field of view are approximately centered upon the marking element.

17. (Original) The device according to claim 12, wherein the photo emitter emits constant light and the photo detector detects diffusely reflected light.

18. (Original) The device according to claim 12, wherein the photo emitter emits pulsed light and the photo detector detects spectrally reflected light.

19. (Original) The device according to claim 1, wherein the detector comprises:

a photo emitter mounted on a first side of the device, wherein said photo emitter emits light towards the marking element to illuminate the strokes;

a first photo detector mounted on a second side of the device, wherein said first photo detector (a) has a first field of view that includes the marking element, (b) detects the strokes using the light reflected off the surface, (c) converts the detected strokes into electronic signals, and (d) sends the electronic signals to the processor; and

a second photo detector mounted on a third side of the device, wherein said second photo detector (a) has a second field of view that includes the marking element, (b) detects the strokes using the light reflected off the surface, (c) converts the detected strokes into electronic signals, and (d) sends the electronic signals to the processor.

20. (Original) The device according to claim 19, wherein the second side is opposite the third side.

21. (Original) The device according to claim 19, wherein the photo emitter, the first photo detector, and the second photo detector are mounted adjacent to the marking element.

22. (Original) The device according to claim 19, wherein the first photo detector and the second photo detector detect the strokes at a periodic rate which is adjusted based on input from an active feedback mechanism.

23. (Original) The device according to claim 19, wherein the light, the first field of view, and the second field of view are approximately centered upon the marking element.

24. (Original) The device according to claim 19, wherein the first field of view overlaps the second field of view.

25. (Original) The device according to claim 19, wherein the photo emitter emits constant light and the first photo detector and the second photo detector detect diffusely reflected light.

26. (Original) The device according to claim 19, wherein the photo emitter emits pulsed light and the first photo detector and the second photo detector detect spectrally reflected light.

27. (Original) The device according to claim 1, wherein the detector comprises:

a multi-segment photo emitter mounted on the device, wherein said multi-segment photo emitter emits light towards the marking element to illuminate the strokes;

a first photo detector mounted on a first side of the device, wherein said first photo detector (a) has a first field of view that includes the marking element, (b) detects the strokes using the light reflected off the surface, (c) converts the detected strokes into electronic signals, and (d) sends the electronic signals to the processor; and

a second photo detector mounted on a second side of the device, wherein said second photo detector (a) has a second field of view that includes the marking element, (b) detects the strokes using the light reflected off the surface, (c) converts the detected strokes into electronic signals, and (d) sends the electronic signals to the processor.

28. (Original) The device according to claim 27, wherein the multi-segment photo emitter is in the shape of a ring, with the center of the ring perpendicular to a z-axis that passes through a center of the marking element and is parallel to a major axis of the device.

29. (Original) The device according to claim 27, wherein the first side is opposite the second side.

30. (Original) The device according to claim 27, wherein the multi-segment photo emitter, the first photo detector, and the second photo detector are mounted adjacent to the marking element.

31. (Original) The device according to claim 27, wherein the first photo detector and the second photo detector detect the strokes at a periodic rate which is adjusted based on input from an active feedback mechanism.

32. (Original) The device according to claim 27, wherein the light, the first field of view, and the second field of view are approximately centered upon the marking element.

33. (Original) The device according the claim 27, wherein the first field of view overlaps the second field of view.

34. (Original) The device according to claim 27, wherein the multi-segment photo emitter emits constant light and the first photo detector and the second photo detector detect diffusely reflected light.

35. (Original) The device according to claim 27, wherein the multi-segment photo emitters emits pulsed light and the first photo detector and the second photo detector detect spectrally reflected light.

36. (Currently Amended) The device according to claim 1, wherein the detector comprises:

an array that includes at least one photo emitter and at least one photo detector;

wherein ~~each~~ at least one photo emitter emits light towards the marking element to illuminate the strokes; and

wherein ~~each~~ at least one photo detector (a) has a field of view that includes the marking element, (b) detects the strokes using the light reflected off the surface, (c) converts the detected strokes into electronic signals, and (d) sends the electronic signals to the processor.

37. (Original) The device according to claim 36, wherein the array is in the shape of a ring, with the center of the ring perpendicular to a z-axis that passes through a center of the marking element and is parallel to a major axis of the device.

38. (Currently Amended) The device according to claim 36, wherein the array contains ~~eight~~ a plurality of elements, each element being either a photo emitter or a photo detector.

39. (Original) The device according to claim 38, wherein each element is equally spaced within the array.

40. (Original) The device according to claim 36, wherein the array is mounted adjacent to the marking element.

41. (Currently Amended) The device according to claim 36, wherein ~~each~~ at least one photo detector detects the strokes at a periodic rate which is adjusted based on input from an active feedback mechanism.

42. (Original) The device according to claim 36, wherein the light and the field of view are approximately centered upon the marking element.

43. (Original) The device according to claim 36, wherein each field of view overlaps at least one other field of view.

44. (Currently Amended) The device according to claim 36, wherein ~~each~~ at least one photo emitter emits constant light and ~~each~~ at least one photo detector detects diffusely reflected light.

45. (Currently Amended) The device according to claim 36, wherein ~~each~~ at least one photo emitter emits pulsed light and ~~each~~ at least one photo detector detects spectrally reflected light.

46. (Original) The device according to claim 1, wherein marking element comprises a ball.

47. (Original) The device according to claim 46, wherein the detector comprises:

a first microfeeler in contact with a first side of the ball, said first microfeeler changing impedance as the ball rotates;

a first friction roller in contact with the first microfeeler, wherein said first friction roller detects impedance changes in the first microfeeler as electronic signals and

sends the electronic signals to the processor; and

a second microfeeler in contact with a second side of the ball, said second microfeeler changing impedance as the ball rotates;

a second friction roller in contact with the second microfeeler, wherein said second microfeeler detects impedance changes in the second microfeeler as electronic signals and sends the electronic signal to the processor.

48. (Original) The device according to claim 47, wherein the first side, the second side, and a z-axis are mutually orthogonal, wherein the z-axis passes through a center of the ball and is parallel to a major axis of the device.

49. (Original) The device according to claim 47, wherein the impedance changes are detected at a periodic rate which is adjusted based on input from an active feedback mechanism.

50. (Original) The device according to claim 46, wherein the ball comprises a plurality of discrete magnetic domains asymmetrically distributed over the surface of the ball, said plurality of discrete magnetic domains being uniform size.

51. (Original) The device according to claim 50, wherein the detector comprises:

a first induction coil having evenly spaced symmetrical windings, wherein said first induction coil (a) is positioned adjacent to a first side of the ball, (b) senses ball movement using the plurality of discrete magnetic domains, (c) produces electronic signals based on the ball movement, and (d) sends the electronic signals to the processor; and

a second induction coil having evenly spaced symmetrical windings, wherein said second induction coil (a) is positioned adjacent to a second side of the ball, (b) senses ball movement using the plurality of discrete magnetic domains, (c) produces electronic signals based on the ball movement, and (d) sends the electronic signals to the processor.

52. (Currently Amended) The device according to claim 51, wherein the first side, the second side, and a z-axis are mutually orthogonal, wherein the z-axis passes through a center of the ball and is parallel to a major axis of the device.

53. (Currently Amended) The device according to claim 51, wherein the ~~impedance~~ current changes are detected at a periodic rate which is adjusted based on input from an active feedback mechanism.

54. (Original) The device according to claim 46, wherein the ball includes a plurality of discrete magnetic domains distributed in a characterized non-uniform pattern over the surface of the ball, said plurality of discrete magnetic domains being non-uniform in size.

55. (Original) The device according to claim 54, wherein the detector comprises:

a first induction coil having asymmetrical windings with linearly increasing spacing, wherein said first induction coil (a) is positioned adjacent to a first side of the ball, (b) senses ball movement using the plurality of discrete magnetic domains, (c) produces electronic signals based on the ball movement, and (d) sends the electronic signals to the processor; and

a second induction coil having asymmetrical windings with linearly increasing spacing, wherein said second induction coil (a) is positioned adjacent to a second side of the ball, (b) senses ball movement using the plurality of discrete magnetic domains, (c) produces electronic signals based on the ball movement, and (d) sends the electronic signals to the processor.

56. (Currently Amended) The device according to claim 55, wherein the first side, the second side, and a z-axis are mutually orthogonal, wherein the z-axis passes through a center of the ball and is parallel to a major axis of the device.

57. (Original) The device according to claim 55, wherein the ~~impedance~~ current changes are detected at a periodic rate which is adjusted based on input from an active feedback mechanism.

58. (Currently Amended) The device according to claim 46, wherein the ball ~~includes an outer shell, said outer shell comprising~~ comprises a single magnetic domain.

59. (Original) The device according to claim 58, wherein the detector comprises:

a first induction coil having evenly spaced symmetrical windings, wherein said first induction coil (a) is positioned adjacent to a first side of the ball, (b) senses ball movement using the plurality of discrete magnetic domains, (c) produces electronic signals based on the ball movement, and (d) sends the electronic signals to the processor; and

a second induction coil having evenly spaced symmetrical windings that are uniform in size, wherein said second induction coil (a) is positioned adjacent to a second side of the ball, (b) senses ball movement using the plurality of discrete magnetic domains, (c) produces electronic signals based on the ball movement, and (d) sends the electronic signals to the processor.

60. (Currently Amended) The device according to claim 59, wherein the first side, the second side, and a z-axis are mutually orthogonal, wherein the z–axis passes through a center of the ball and is parallel to a major axis of the device.

61. (Currently Amended) The device according to claim 59, wherein the ~~impedance~~ current changes are detected at a periodic rate which is adjusted based on input from an active feedback mechanism.

62. (Original) A method of detecting handwriting comprising the steps of:

(a) illuminating strokes comprising a character marked on a surface;

(b) detecting light reflected off the surface;

(c) converting the detected light into an electronic signal;

(d) interpreting the electronic signal to identify the strokes; and

(e) identifying the strokes as the character.

63. (Original) The method according to claim 62, wherein step (b) is performed by detecting the light at a periodic rate.

64. (Original) The method according to claim 63, with the additional step of adjusting the periodic rate if the set of strokes cannot be identified as the character in step (e), wherein an active feedback mechanism is used to determine the amount by which the rate is adjusted.

65. (Original) The method according to claim 62, wherein step (d) is performed by:

characterizing each detected stroke as one in a set of reference strokes by comparing each detected stroke with the reference strokes; and

selecting for each detected stroke a reference stroke that is sufficiently similar to the detected stroke.

66. (Original) In a pen utilizing a ball for marking strokes comprising a character on a surface, a method of detecting handwriting comprising the steps of:

(a) detecting the strokes by directly detecting rotations of the ball;

(b) converting the detected rotations into electronic signals;

(c) interpreting the electronic signals to identify the strokes; and

(d) identifying the strokes as the character.

67. (Original) The method according to claim 66, wherein step (d) is performed by:

characterizing each detected stroke as one in a set of reference strokes by comparing each detected stroke with the reference strokes; and

selecting for each detected stroke a reference stroke that is sufficiently similar to the detected stroke.

68. (Original) The method according to claim 66, wherein step (a) is performed by:

generating a first change in impedance as the ball rotates along a first axis;

generating a second change in impedance as the ball rotates along a second axis;

measuring the first change in impedance; and

measuring the second changes in impedance.

69. (Original) The method according to claim 68, wherein the first axis, the second axis, and a z-axis are mutually orthogonal, wherein the z-axis passes through a center of the ball and is parallel to a major axis of the pen.

70. (Original) The method according to claim 66, wherein the ball includes at least one magnetic domain.

71. (Original) The method according to claim 70, wherein step (a) comprises the steps of:

generating a first current along a first axis using the at least one magnetic domain;

generating a second current along a second axis using the at least one magnetic domain;

measuring the first current; and

measuring the second current.

72. (Original) The method according to claim 71, wherein the first axis, the second axis, and a z-axis are mutually orthogonal, wherein the z-axis passes through a center of the ball and is parallel to a major axis of the pen.

73. (New) The device according to claim 1, wherein the detector detects quadrature elements using a feed-forward and feed-backward mechanism.

74. (New) The device of claim 1, wherein the processor identifies the character by combining recognized quadrature elements of the character and comparing the combined recognized quadrature elements with a reference set of quadrature data.

75. (New) The device of claim 1, wherein the processor identifies the character by comparing a recognized quadrature element with a reference set of quadrature data.

76. (New) The device of claim 3, wherein the processor comprises a first processor for characterizing each detected stroke as a quadrature element using a set of reference quadrature elements, and a second processor for identifying the character, the first and second processor functioning asynchronously.

77. (New) The device of claim 1, wherein the processor characterizes each detected stroke as a quadrature element as one in a set of reference quadrature elements by representing each detected stroke as a quadrature element selected from the group consisting of: a basis vector, eigenvector, polynomial, Fast Fourier Transform function, and a combination of vector data and function translations.

78. (New) The device of claim 10, wherein timing adjustments are made to either increase or decrease sampling rates.

79. (New) The device of claim 9 wherein the detection parameter is a sampling rate of the detector.

80. (New) The device of claim 9 further comprising a character output mechanism for outputting a digital representation of the character.

81. (New) The device of claim 1 further comprising a character storage mechanism for storing a signal representing the character.

82. (New) The device of claim 9 further comprising a character storage mechanism for storing a digital representation of the character.

83. (New) The device according to claim 12, wherein the photo emitter emits constant light and the photo detector detects spectrally reflected light.

84. (New) The device according to claim 12, wherein the photo emitter emits pulsed light and the photo detector detects diffusely reflected light.

85. (New) The device according to claim 19, wherein the photo emitter emits constant light and the first photo detector and the second photo detector detect spectrally reflected light.

86. (New) The device according to claim 19, wherein the photo emitter emits pulsed light and the first photo detector and the second photo detector detect diffusely reflected light.

87. (New) The device according to claim 27, wherein the multi-segment photo emitter emits constant light and the first photo detector and the second photo detector detect spectrally reflected light.

88. (New) The device according to claim 27, wherein the multi-segment photo emitters emits pulsed light and the first photo detector and the second photo detector detect diffusely reflected light.

89. (New) The device according to claim 36, wherein at least one photo emitter emits constant light and at least one photo detector detects spectrally reflected light.

90. (New) The device according to claim 36, wherein at least one photo emitter emits pulsed light and at least one photo detector detects diffusely reflected light.

91. (New) The method according to claim 63, with the additional step of adjusting the periodic rate if the set of quadrature elements cannot be identified as the character in step (e), wherein an active feedback mechanism is used to determine the amount by which the rate is adjusted.

92. (New) The method according to claim 62, wherein step (d) is performed by:

characterizing each detected quadrature element as one in a set of reference quadrature elements by comparing each detected quadrature element with the reference

quadrature elements; and

selecting for each detected quadrature element a reference quadrature element that is sufficiently similar to the detected quadrature element.

93. (New) In a pen utilizing a ball for marking a set of quadrature elements comprising a character on a surface, a method of detecting handwriting comprising the steps of:

(a) detecting the quadrature elements of the character by directly detecting rotations of the ball;

(b) converting the detected rotations into electronic signals;

(c) interpreting the electronic signals to identify the quadrature elements; and

(d) identifying the quadrature elements as the character.

94. (New) The method according to claim 93, wherein step (d) is performed by:

characterizing each detected quadrature element as one in a set of reference quadrature elements by comparing each detected quadrature element with the reference quadrature elements; and

selecting for each detected quadrature element a reference quadrature element that is sufficiently similar to the detected quadrature element.

95. (New) A device for writing and processing handwriting comprising:

a marking element for making strokes comprising a character on a surface;

a detector for detecting each stroke on the surface, and

a processor coupled to the detector, characterizing each detected stroke as one in a set of reference strokes, wherein the processor characterizes each detected stroke as one in a set of reference strokes by representing each detected stroke as a vector representation, comparing the vector representation of each detected stroke with vector representations of the reference strokes, and selecting for each detected stroke a reference stroke whose vector representation is sufficiently similar to the vector representation of the detected stroke.

96. (New) A device for writing and processing handwriting comprising:

a marking element for making at least one quadrature element on a surface, the quadrature element representing at least a portion of a character;

a detector for detecting each quadrature element on the surface, and

a processor coupled to the detector, characterizing each detected quadrature element as one in a set of reference quadrature elements, wherein the processor characterizes each detected quadrature element as one in a set of reference quadrature elements by representing each detected quadrature element as a vector representation, comparing the vector representation of each detected quadrature element with vector representations of the reference quadrature elements, and selecting for each detected quadrature element a reference quadrature element whose vector representation is sufficiently similar to the vector representation of the detected quadrature element.